AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph beginning at **page 17, line 1**, and insert the following rewritten paragraph:

Here, the m-th normal gait parameter is determined by correcting the parameter to be corrected out of the (m-1)th normal gait parameter on the basis of the degree of deviation of a normal gait (normal gait for at least one-cycle period) generated using the (m-1)th normal gait parameter and the m-th dynamic model from the aforesaid predetermined boundary condition (the degree of deviation before correction), that is, on the basis of the degree of matching of the (m-1)th normal gait parameter to the aforesaid predetermined boundary condition on the m-th dynamic model. Then, the correction is determined such that, when a gait is generated using the m-th normal gait parameter determined thereby and the m-th dynamic model, the degree of the deviation of the normal gait from the aforesaid predetermined boundary condition (the degree of deviation after correction) is smaller than the degree of deviation before correction corresponding to the (m-1)th normal gait parameter and that the degree of deviation after correction falls within a predetermined permissible range of the degree of deviation.

Please replace the paragraph beginning at **page 32, line 5**, and insert the following rewritten paragraph:

According to this, in the twelfth invention, it is possible to efficiently determine

an m-th normal gait parameter that satisfies a boundary condition of a normal gait while at the same time reducing the parameters to be corrected when determining the m-th normal gait parameter. Further, in the fourteenth invention, it is possible to efficiently determine an m-th gait parameter for bringing a desired gait in the aforesaid predetermined period close to a normal gait while at the same time reducing the parameters to be corrected. In the fourteenth invention, the aforesaid predetermined state amount, in particular, is ideally the weighted mean values of the position and the velocity of the body ~~of the body~~ or the weighted mean values of the position and the velocity of the total center-of-gravity or a divergence component.

Please delete the paragraph beginning at **page 64, line 2**, as follows:

~~The body mass point~~

Please replace the paragraph beginning at **page 85, line 16**, and insert the following rewritten paragraph:

Supplementally, "the first model," "the second model," ....., and "the n-th model" in Fig. 14 refer to the first dynamic model, the second dynamic model, ..., and the n-th dynamic model. Hereinafter, in this description, generally, a k-th dynamic model (k=1, 2, ..., n) will be referred to simply as the k-th model in some cases. In the first embodiment, n=3. Further, the body inclination restoring moment ZMP-converted value peak value ZMPrecpeak~~ZMPrecpeek~~ determined in the processing of the flowchart shown in Fig. 14 indicates the peak value of the ZMP-

converted value ZMPrec (the amount of deviation from a reference desired ZMP (the desired ZMP defined by the ZMP trajectory parameters determined in S022)) of the floor reaction force moment required for bringing the body posture close to a reference body posture in the one-leg supporting period of the robot 1 (more specifically, the period from the moment immediately after the one-leg supporting period begins to the moment immediately before it ends. Hereinafter, it will be referred to as the body inclination angle restoring period in some cases), an example thereof being shown in Fig. 25. As shown in the figure, ZMPrec is shown in the trapezoidal patterns, the peak values (the heights of the trapezoids) being denoted by ZMPrecpeak~~ZMPrecpeek~~.

Please replace the paragraph beginning at **page 88, line 26**, and insert the following rewritten paragraph:

Subsequently, in S252, the initial (time Ts) body horizontal position, the initial body horizontal velocity, the initial body posture angular velocity, and the body inclination restoring moment ZMP-converted value peak value on the first model (the first dynamic model) are taken as the search objects (the search objects correspond to the parameters to be corrected in the aforesaid second invention), and the candidates (Xs1, Vx1, ωbs1, and ZMPrecpeak1~~ZMPrecpeek1~~) of the initial states of the search objects are provisionally determined (the initial values of the candidate values of the parameters of the search objects in the normal gait parameter are determined). In this case, the candidate values to be provisionally determined may be basically arbitrary; they may be determined on the basis of, for example, the

initial states of the normal gait determined for generating the last time's gait. This provisional determination will provisionally determine the entire normal gait parameter, including the search objects. These provisionally determined values are the values observed in the supporting leg coordinate system of the first turning gait (the aforesaid supporting leg coordinate system of next time's gait).

Please replace the paragraph beginning at **page 91, line 3**, and insert the following rewritten paragraph:

Subsequently, in S258, a first model gait as the normal gait is generated using the first dynamic model up to the time Ts+Tcyc (the terminating end of the normal gait) on the basis of the normal gait parameter that includes the values of current search candidates, the vertical position and the vertical velocity of the body 3, and ZMPrecpeak1~~ZMPrecpeek1~~. This processing is executed by the subroutine processing shown by the flowchart of Fig. 17, and further, the processing of S304 of this Fig. 17 is executed by the subroutine processing shown by the flowchart of Fig. 18. Further, the processing of S412 of Fig. 18 is executed by the subroutine processing shown by the flowchart of Fig. 19. These processing will be described hereinafter.

Please replace the paragraph beginning at **page 92, line 18**, and insert the following rewritten paragraph:

Meanwhile, if the determination result of S264 is NO, then the candidates of a

plurality of (four in the present embodiment) search objects obtained by changing the values of the individual parameters by a predetermined extremely small amounts ΔXs, ΔVx, Δωbs, ΔZMPrecpeak ~~ΔZMPrecpeek~~ are determined in the vicinity of the values of the current search objects (Xs1, Vx1, ωbs1, ZMPrecpeak1~~ZMPrecpeek1~~), and the same processing as that of S258 to S262 is carried out to determine the boundary condition errors corresponding to the candidates of the individual search objects on the basis of the normal gait parameter that includes the candidates of the individual search objects (the normal gait parameter having the search objects of the current normal gait parameter corrected to the newly determined candidates).

Please replace the paragraph beginning at **page 93, line 6**, and insert the following rewritten paragraph:

Subsequently, in S268, the new candidates of the search objects (Xs1, Vx1, ωbs1, ZMPrecpeak1~~ZMPrecpeek1~~) are determined by an exploratory technique, such as the steepest descent method or the simplex method, on the basis of the current (Xs1, Vx1, ωbs1, ZMPrecpeak1~~ZMPrecpeek1~~) and the boundary condition errors corresponding to the individual candidates of the search objects in the vicinity thereof. Then, the processing from S256 is repeated again.

Please replace the paragraph beginning at **page 93, line 14**, and insert the following rewritten paragraph:

As described above, (Xs1, Vx1, ωbs1, ZMPrecpeak1~~ZMPrecpeek1~~) being the

search objects, the normal gait parameter that satisfies the boundary condition of the normal gait is exploratorily determined.

Please replace the paragraph beginning at **page 93, line 18**, and insert the following rewritten paragraph:

Incidentally, the processing of S200-1 explained above constitutes the first normal gait parameter determining means in the second invention. And, the gait parameter including the lastly searched (Xs1, Vx1, ωbs1, ZMPrecpeak1~~ZMPrecpeek1~~) by this processing corresponds to the first normal gait parameter in the second invention.

Please replace the paragraph beginning at **page 100, line 25**, and insert the following rewritten paragraph:

To supplement the explanation of the relevancy to the invention of the present application, the processing of S200-2 to 200-n of Fig. 14 constitutes a normal gait parameter correcting means in the second invention. And the boundary condition error determined in S1212 of Fig. 16 carried out in the individual processing of S200-2 to 200-n in Fig. 14 corresponds to the degree of deviation in the second invention. Further, the gait parameter having a plurality of candidates in the vicinity of the values of current search objects (Xsn, Vxn, ωbsn, ZMPrecpeakn~~ZMPrecpeekn~~), which is determined in S1216 in Fig. 16, as search objects (parameters to be corrected) corresponds to the auxiliary normal gait

parameter in an eighteenth invention, and the boundary condition errors individually associated with those auxiliary normal gait parameters correspond to the auxiliary degrees of deviation in the eighteenth invention. Incidentally, the search objects (Xsn, Vxn, ωbsn, ZMPrecpeaknZMPrecpeekn) of course correspond to the parameters to be corrected in the second invention, but (Zsn, Vzsn) are also parameters to be corrected in the second invention. This is because (Zsn, Vzsn) depends on Xsn, Vxsn, θbsn, and ωsn determined or provisionally determined as described above, so that (Zsn, Vzsn) will be dependently corrected when Xsn, Vxsn, and ωsn are corrected. Thus, the parameters that are dependent on direct search objects and corrected are also included in the parameters to be corrected in the second invention.

Please replace the paragraph beginning at **page 107, line 25**, and insert the following rewritten paragraph:

As shown in Fig. 21, the processing of S700-1, S700-2, ..., S700-n (n=3 in the first embodiment) is sequentially carried out, and lastly, a ZMP correction parameter "a" and a first peak value ZMPrecpeaka ZMPrecpeeka and a second peak value ZMPrecpeakbZMPrecpeekb of a body inclination restoring moment ZMP-converted value are determined such that the divergence component at the terminating end of the current gait agrees or substantially agrees with the divergence component at the beginning of a normal gait (such that the boundary condition at the terminating end of the current time's gait is satisfied) on the n-th model (the n-th dynamic model). Here, the first peak value ZMPrecpeaka ZMPrecpeeka and the

second peak value ZMPrecpeakb ~~ZMPrecpeekb~~ of a body inclination restoring moment ZMP-converted value obtained in the processing of the flowchart in Fig. 21 indicate the two peak values of the pattern of the ZMP-converted value of a floor reaction force moment required to bring a body posture close to a reference body posture during the body inclination angle restoring period [Ta,Tb] of the current time's gait, an example thereof being shown in Fig. 26. The number of peak values of the body inclination restoring moment ZMP-converted value has been one in the case of a normal gait; in the present embodiment, however, the first peak value ZMPrecpeaka ~~ZMPrecpeeka~~ and the second peak value ZMPrecpeakb ~~ZMPrecpeekb~~ are used as the two adjustable parameters of a body inclination restoring moment ZMP-converted value so as to make the body posture angle and its angular velocity at the terminating end of the current time's gait coincide with the body posture angle and its angular velocity, respectively, at the beginning of the normal gait. In the present embodiment, as shown in Fig. 26, the body inclination restoring moment ZMP-converted value in the current time's gait has a pattern combining a trapezoidal pattern in the first half and another trapezoidal pattern in the latter half of the one-leg supporting period. The peak value of the trapezoidal pattern in the first half is the first peak value ZMPrecpeaka~~ZMPrecpeeka~~, and the peak value of the trapezoidal pattern in the latter half is the second peak value ZMPrecpeakb~~ZMPrecpeekb~~.

Please replace the paragraph beginning at **page 109, line 25**, and insert the following rewritten paragraph:

The overview of the processing shown in Fig. 21 will be explained. First, the ZMP correction parameter "a" and the first peak value ZMPrecpeaka ~~ZMPrecpeeka~~ and the second peak value ZMPrecpeakb ~~ZMPrecpeekb~~ of the body inclination restoring moment ZMP-converted value are exploratorily determined as the search objects such that the current time's gait is connected to a normal gait on the first dynamic model (the divergence component at the terminating end of a current time's gait agrees or substantially agrees with the divergence component at the beginning of a normal gait), that is, such that the current time's gait generated using the current time's gait parameter, including the parameters determined in S028, and the first dynamic model satisfies the boundary condition at the terminating end thereof. Then, the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb~~ZMPrecpeekb~~ determined using the first dynamic model are used as new exploratory initial values to exploratorily determine anew the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb ~~ZMPrecpeekb~~ in order to make the current time's gait connect to the normal gait (in order to satisfy the boundary condition at the terminating end of the current time's gait) on the second dynamic model. Further, the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb ~~ZMPrecpeekb~~ determined using the second dynamic model are used as new exploratory initial values to exploratorily determine anew the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb ~~ZMPrecpeekb~~ in order to make the current time's gait connect to the normal gait (in order to satisfy the boundary condition at the terminating end of the current time's gait) on the third dynamic model. More generally, when the quantity of the dynamic models is denoted by n, the processing in which the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb ~~ZMPrecpeekb~~ determined using an

(m-1)th dynamic model (m: integer of 2 or more but n or less) are used as the search initial values to exploratorily determine anew the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb ~~ZMPrecpeekb~~ such that the current time's gait is connected to the normal gait on the m-th dynamic model is repeated. Then, lastly, the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb ~~ZMPrecpeekb~~ determined using the n-th dynamic model are obtained as the corrected values of the gait parameter (the gait parameter of the current time's gait) to be determined.

Please replace the paragraph beginning at **page 111, line 11**, and insert the following rewritten paragraph:

The processing of S700-1 is, to be more specific, carried out as shown by the flowchart of Fig. 22. First, in S750, the initial candidates of the values of "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb~~ZMPrecpeekb~~, which are search objects, on the first model (the first dynamic model) are provisionally determined. In this case, the initial candidates may basically be arbitrary and may be determined on the basis of, for example, the values of the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb~~ZMPrecpeekb~~ finally determined at the time of creating a last time's gait.

Please replace the paragraph beginning at **page 111, line 21**, and insert the following rewritten paragraph:

Subsequently, the loop processing of S754 to S766 is carried out. The

processing will be schematically explained. First, in S754, a current time's gait (a provisional current time's gait) is calculated using the current values of the "a", ZMPrecpeakaZMPrecpeeka, and ZMPrecpeakbZMPrecpeekb, which are search objects, and the first model. More specifically, a provisional current time's gait is calculated using the current time's gait parameter constructed of a ZMP trajectory parameter corrected on the basis of the current value of the ZMP correction parameter "a", the current values of ZMPrecpeaka ZMPrecpeeka and ZMPrecpeakbZMPrecpeekb, and the parameters other than the ZMP trajectory parameter determined in S026, and the first model. More specific processing of S754 will be described later.

Please replace the paragraph beginning at **page 112, line 8**, and insert the following rewritten paragraph:

Then, in S756 to S766, the difference between the divergence component at the terminating end of the provisional current time's gait (the estimated landing time of a free leg foot of the current time's gait) calculated in S754 and the divergence component q" at the beginning of a normal gait (lastly calculated using the n-th model in the aforesaid S024), the difference between the body posture angle at the terminating end of the provisional current time's gait and the body posture angle at the beginning of the normal gait (lastly calculated using the n–th model in the aforesaid S024), and the difference between the angular velocity of the body posture angle at the terminating end of the provisional current time's gait and the body posture angular velocity at the beginning of the normal gait (lastly calculated using

the n-th model in the aforesaid S024) are determined. Then, it is determined whether all the values of these differences satisfy a condition in which they fall within permissible ranges (whether they approximate zero), and if they do not satisfy the condition, then the values of the search objects are changed. This is repeated to finally determine the "a", ZMPrecpeaka~~ZMPrecpeeka~~, and ZMPrecpeakb ~~ZMPrecpeekb~~ as the corrected values of the gait parameter that allows the provisional current time's gait to connect to the normal gait on the first model.

Please replace the paragraph beginning at **page 114, line 17**, and insert the following rewritten paragraph:

Meanwhile, if the determination result of S762 is NO, then the candidates of a plurality of (three in the present embodiment) search objects obtained by changing the values of the individual parameters by a predetermined extremely small amounts Δa, ΔZMPrecpeaka~~ΔZMPrecpeeka~~, and ΔZMPrecpeakb~~ΔZMPrecpeekb~~ are determined in the vicinity of the values of the current search objects (a1, ZMPrecpeaka1~~ZMPrecpeeka1~~, and ZMPrecpeakb1~~ZMPrecpeekb1~~), and the same processing as that of S754 to S760 is carried out on the basis of the current time's gait parameter that includes the candidates of the individual search objects (the current time's gait parameter in which the search objects of the present current time's gait parameter have been corrected to newly determined candidates), thereby determining a set of errors (errq, θberr, and ωberr) corresponding to the candidate of each search object.

Please replace the paragraph beginning at **page 115, line 6**, and insert the following rewritten paragraph:

Subsequently, in S766, the new candidates of the search objects (a1, ZMPrecpeaka1~~ZMPrecpeeka1~~, and ZMPrecpeakb1~~ZMPrecpeekb1~~) are determined by an exploratory technique, such as the steepest descent method or the simplex method, on the basis of the current (a1, ZMPrecpeaka1~~ZMPrecpeeka1~~, and ZMPrecpeakb1~~ZMPrecpeekb1~~) and the sets of errors (errq, θberr, and ωberr) corresponding to the individual candidates of the search objects in the vicinity thereof. Then, the processing from S754 is repeated again.

Please replace the paragraph beginning at **page 115, line 15**, and insert the following rewritten paragraph:

As described above, (a1, ZMPrecpeaka1~~ZMPrecpeeka1~~, and ZMPrecpeakb1~~ZMPrecpeekb1~~) being the search objects, the current time's gait parameter that satisfies the boundary condition at the terminating end of the current time's gait is exploratorily determined.

Please replace the paragraph beginning at **page 116, line 11**, and insert the following rewritten paragraph:

In S1700, the values of search objects previously determined (the values in S700-m) by using the m-th model (m=n-1) are set as the initial values (initial

candidate values) of "a", ZMPrecpeakaZMPrecpeeka, and ZMPrecpeakbZMPrecpeekb, which are the search objects. Then, the processing of S1704 and S1714 calculates a provisional current time's gait by using the n-th model.

Please replace the paragraph beginning at **page 120, line 2**, and insert the following rewritten paragraph:

Further, if the current time k (the time in a provisional current time's gait that is being created) is time within the aforesaid body inclination angle restoring period, then the body angular acceleration β is determined by the processing of S518 to S526 such that a floor reaction force moment corresponding to the instantaneous value of a body inclination restoring moment ZMP-converted value pattern (this depends on the current candidate values of the first peak value ZMPrecpeaka ZMPrecpeeka and the second peak value ZMPrecpeakb ZMPrecpeekb of the body inclination restoring moment ZMP-converted value provisionally determined in S700-n(n=1,2 or 3) and the current time k. Refer to Fig. 26) is generated on the n-th dynamic model. Further, the body horizontal acceleration is determined as the difference between a body horizontal acceleration for the floor reaction force moment about a desired ZMP generated by the body translational mode to become zero and a body horizontal acceleration that generates a floor reaction force moment equivalent to the floor reaction force moment due to the body angular acceleration β on the n-th dynamic model. Thus, the body angular acceleration β and the body horizontal acceleration α are determined such that a desired ZMP is satisfied while

restoring a body posture toward the reference body posture.

Please replace the paragraph beginning at **page 121, line 8**, and insert the following rewritten paragraph:

To supplement the relevance to the invention of the present application, the processing of S700-2 to 700-n in Fig. 21 constitutes the gait parameter correcting means in the first invention. And, a set of errq, θberr, and ωberr determined in S1712 in Fig. 23 carried out in the processing of each of S700-2 to 700-n in Fig. 21 corresponds to the degree of deviation in the first invention. Further, the gait parameter having a plurality of candidates in the vicinity of the values of the current search objects (an, ZMPrecpeakan~~ZMPrecpeekan~~, and ZMPrecpeakbn~~ZMPrecpeekbn~~) that are determined in S1714 in the same Fig. 23 as the search objects (parameters to be corrected) correspond to the auxiliary gait parameters in the seventeenth invention, and a set of errq, θberr, and ωberr respectively corresponding to the auxiliary gait parameters corresponds to the auxiliary degree of deviation in the seventeenth invention. Incidentally, the search objects (an, ZMPrecpeakan~~ZMPrecpeekan~~, and ZMPrecpeakbn~~ZMPrecpeekbn~~) are of course the parameters to be corrected in the second invention. In this case, "an" is for correcting a desired ZMP trajectory parameter, so that at least a part of the desired ZMP trajectory parameter itself may be said to be also a parameter to be corrected.

Please replace the paragraph beginning at **page 124, line 8**, and insert the

following rewritten paragraph:

After the processing of S030 is carried out, or if the determination result of S016 is NO, then the procedure proceeds to S032 wherein the instantaneous values of the current time's gait are determined one after another. The subroutine processing of this processing is the same as the aforesaid processing of the flowchart of Fig. 24 explained in relation to generating a provisional current time's gait. However, the dynamic model used in this case is fixed to the third model in the present embodiment. Further, as the ZMP correction parameter "a" defining a ZMP correction amount and the first peak value ZMPrecpeaka ~~ZMPrecpeeka~~ and the second peak value ZMPrecpeakb ~~ZMPrecpeekb~~ of a body inclination restoring moment ZMP-converted value, the ones finally determined in S028 of Fig. 12 (the ones finally searched for in the processing of S700-n of Fig. 21) are used.